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led, but did not, to the substitution of one or more from the unused stock. The perfection of the method is such that it can hardly happen that any such substitution would be necessary.

The last step is the most troublesome. Every fibre has now to be lodged in its groove. This may be done approximately first—always with a brush—and a very weak varnish applied. The obstinate ones can then be manipulated and coaxed with greater freedom. And, lastly, a stronger varnish fixes them all.

I do not know how these things are done by the professional opticians. But I do know that, both in this case and in a second, the intervals between the wires were less unequal after the operation than before. The improvement in the uniformity of the wires as to thickness might be a matter of opinion, but the greater regularity is on record, numerically, as a fact. I infer from this that the method is surer, if not easier.

*Observations of the Total Solar Eclipse of April 16, 1874, at
Klipfontein, Namaqualand, South Africa.*

By E. J. Stone, Esq.

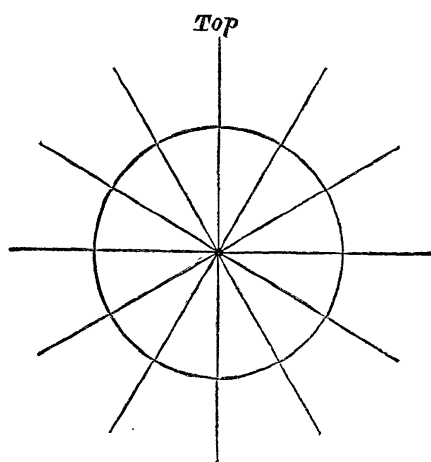
(*Extract from a Letter to the Astronomer Royal.*)

I observed the eclipse from Klipfontein, a station about 3,000 feet above the sea-level. The sky was perfectly clear, and no finer day could have been wished for. I had borrowed a four-inch telescope, mounted as an altazimuth, from Mr. H. Solomon. My spectroscope was one with two dense flint prisms of 60° ; a fair amount of dispersion, therefore, being thus obtained. My great difficulty was to attach the spectroscope firmly to the telescope. Ultimately I was obliged to give up all idea of using the prism of comparison, and to fix the tubes together by wrappers of wash-leather. In this way I secured a very firm connexion between the spectroscope and telescope. I placed two wires in the focus of the telescope of the spectroscope for estimations, and determined to measure only the position of one line in the Corona, the micrometer wire being left untouched until the reappearance of the Fraunhofer lines, when the differences between the line measured and these lines could easily be fixed.

The slit was set as wide as would allow of a clear and distinct view of the Fraunhofer lines. This I did because I expected to find the spectrum of the Corona faint, but was anxious to see whether the Fraunhofer lines were present or not in the spectrum of the Corona. I could not change the width of the slit without taking the spectroscope off the telescope, on account of the way in which I had been compelled to join them together.

During the partial eclipse I most carefully examined the speculum near the Moon's edge, by comparing it with the spectrum away from the Moon's edge, to see whether any fresh

lines were produced by any absorbing medium around the Moon, but I could not find a trace of any difference in the spectra near the Moon's edge and away from it. My slit was so placed that it was parallel to a tangent at the point of last appearance of the sun-light; and as the totality approached, my wife, by the aid of the finder, kept the Sun's limb about half-way across the slit. At the instant of totality the whole field appeared full of bright lines; but I had scarcely time to begin counting these lines before the greater number of them vanished, and the spectrum resolved itself into little more than that of hydrogen gas. Not wishing to spend the few precious moments available upon the spectrum of the prominences, I determined to see what the brightness of the Corona really was before turning the telescope upon it. This was the only view of the eclipse I allowed myself apart from the spectroscope, and I probably spent half a minute lost in admiration of the scene presented to me. The rose-coloured prominences reached very nearly all around the Moon's limb. My wife says there was one, and only one complete apparent break in the continuity. The height varied, of course, very considerably at different parts of the Sun's limb. The Corona was much brighter than I expected to have found it; but its constitution appeared to me uniform throughout, except that its brightness was less as you proceeded further from the Sun. I have a drawing of the Corona by Miss Alice Hall, which in my opinion, and in that of my wife, who observed the eclipse through a pretty good finder, very correctly represents the Corona as seen from our station. I have also a drawing made about 500 miles away, which agrees in all the principal points with that by Miss Hall. I believe that there cannot be a doubt, from these drawings, that the great features of the Corona were identical as seen from these two distant stations. One or two smaller drawings also agree in the principal features, and these drawings are, I think, more to be trusted than usual, from my instructions to refer the prominent points to sectors of 30° having been followed. Diagrams like the rough figure were



prepared, and the line top and bottom adjusted so that it was the section of the paper by a vertical plane as defined by a string with a weight. I believe from the comparisons made, and what I myself saw, that the whole Corona, as seen in South Africa, was a solar appendage. Returning now to my own work — On first moving the telescope away from the prominences, I certainly saw two faint lines less refrangible than E, and one very bright line not far from E; but on moving the telescope more

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away from the limb of the Sun I appeared to have lost those fainter lines, and I did not subsequently see them. The spectrum of the Corona appeared to consist of one very bright line and an ordinary sun-light spectrum. I feel perfectly convinced that, although from the faintness of this sun-light spectrum the lines could only be seen with some difficulty, that the Fraunhofer lines were present in the spectrum of the Corona. I examined this point again and again, and I feel more than ever certain upon the point, from my wife's recollection of my strong expression of opinion upon it at the time I was making the examination.

Having carefully looked to this point, I unclamped the spectroscope, and swept over the whole spectrum from the extreme red to the extreme violet; but, independently of the bright line referred to before, I could not at this time see any traces whatever of bright lines. My instrument was then again clamped, and the bright line most carefully bisected by the micrometer wire. I then re-examined the spectrum for Fraunhofer's lines, but without touching the micrometer or moving the telescope even, until the total eclipse was over and the Fraunhofer lines appeared again in all their distinctness. The micrometer was then read, and the coronal line referred to two known lines near it by the micrometer. The wave-length of this bright line agrees so closely with that given by Young, that I could not with my dispersion answer for so small a difference. I am perfectly certain about the numerous lines seen in the spectrum close to the Sun's edge at the commencement of the totality, but the strata giving this spectrum must lie very close to the photosphere, for they were almost immediately covered by the advancing limb of the Moon. I am not prepared to say that the line spectrum of the Corona did consist entirely of one bright line, for, as I have said, I did see three lines near the Sun's limb in the brighter part of the Corona; but I am prepared to say that in the spectrum of the Corona, at some distance from the Sun, and away completely from the red prominences, there was no line in the spectrum of any degree of brightness except the one measured, and that there certainly was in addition to this an ordinary sun-light spectrum with Fraunhofer lines. I presume this spectrum must arise from the reflexion of the sun-light from the gas giving the line spectrum, and that we thus account for the polarisation of the light of the Corona in the plane through the Sun's centre. The natives were much afraid, and went to their huts. They got up a tale that I had brought the eclipse with me, and was looking for a missing star. Independently of the eclipse, I have made magnetical observations at four stations in Namaqualand, one at the Orange River.

Royal Observatory, Cape of Good Hope.
1874, May 11.